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are lost in the intervals of stripping. It does not disturb the fish in the process of spawning. It insures a perfectly natural impregnation.

The question whether naturally impregnated eggs are better than the stripped eggs, is not yet settled. It is certain that more eggs can be impregnated by the stripping process, but that the resulting fish are as healthy as those grown from naturally fertilized eggs, is not yet definitely proved. We are inclined to think that when the stripping is properly performed there is little difference. However this may be, a few eggs more or less are of little consequence to the trout-breeder; while convenience and speed together with certainty of result are, as in every other art, of prime importance.

REVIEWS.

Economical Entomology in Missouri.* — The annual appearance of a volume containing so much that is new † regarding the common injurious insects of a single State, is a proof that people are giving increased attention to the subject of applied entomology, and that it is considered as one of the first importance to the agricultural community as well as the country at large. There should indeed be an entomologist in each State ‡ whose sole business it should be to acquaint himself with the habits of the injurious insects, the best remedies against their attacks, and above all the habits of their insect parasites, which keep them under, as well as the habits of birds, which also hold them in check; and lastly, the State should liberally illustrate, print and distribute the entomologist's report. By so doing, not only would the interests of agriculture be promoted, and thousands of dollars annually saved to the State (though each legislator who unwillingly votes a thousand dollars or more may sincerely believe that he is robbing the treasury, while actually refilling it to twice that amount), but the country at large shares in the increased knowledge; and science and popular education are in no small degree promoted. The works of Dr. Harris, published by the liberality of the State of Massachusetts, are known all over Europe; in other words, throughout nearly the whole civilized world, and so are those of Dr. Fitch, the State Entomologist of New York, while the writings of Mr. Walsh, late State Entomologist of Illinois, containing so much that is novel and interesting to theoretical as well as practical entomology, are read and sought after by European authors.

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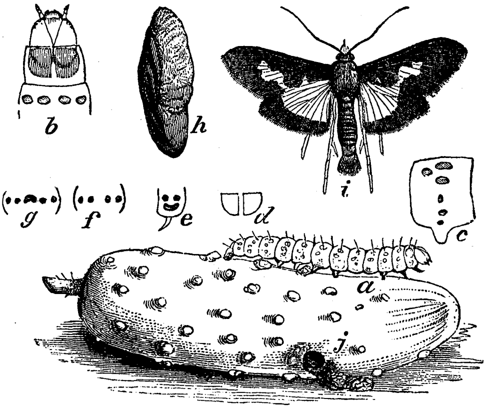
*Second Annual Report on the Noxious, Beneficial and other Insects, of the State of Missouri, made to the State Board of Agriculture. By C. V. Riley, State Entomologist, Jefferson City, 1870. 8vo. pp. 141. With numerous wood cuts. For sale at the Naturalist's Book Agency, 75 cents.

†While a large proportion of this report is reprinted from the "American Entomologist," of which Mr. Riley is the editor, yet the observations were made by him as the State Entomologist, and that able magazine may be said to be in a sense the entomological organ of the Missouri Board of Agriculture. [We regret to learn that the "American Entomologist" will be suspended for a year. We trust to see it revived at the end of that time, and meanwhile shall sorely miss its monthly visits.]

‡Since this report was printed the State of Illinois has appointed Dr. Le Baron to succeed the late Mr. Walsh as State Entomologist of Illinois; and Dr. A. S. Packard, Jr., has been this year appointed State Entomologist, by the Board of Agriculture of the State of Massachusetts. The State of New York has published nine reports on noxious and beneficial insects by Dr. Fitch, and the State of Maine two reports, though she appointed no State Entomologist.

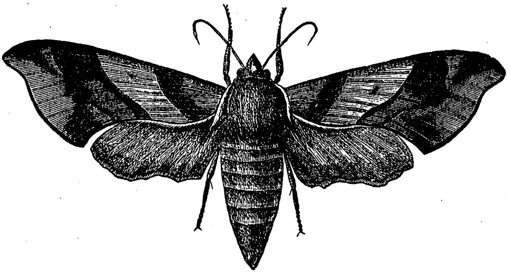
Fig. 126.



Pickle Worm.

A true knowledge of practical entomology may well be said to be in its infancy, when, as is well known to agriculturists, the cultivation of wheat has almost been given up in portions of the northern states from the attacks of the wheat midge, Hessian fly, joint worm and chinch bug. "According to Dr. Shimer's estimate, which may be considered a reasonable one, in the year 1864 three-fourths of the wheat and one-half of the corn crop were destroyed by the chinch bug throughout many extensive districts, comprising almost the entire northwest. At the average annual rate of interest, according to the United States census, in the State of Illinois, the wheat crop of 1864

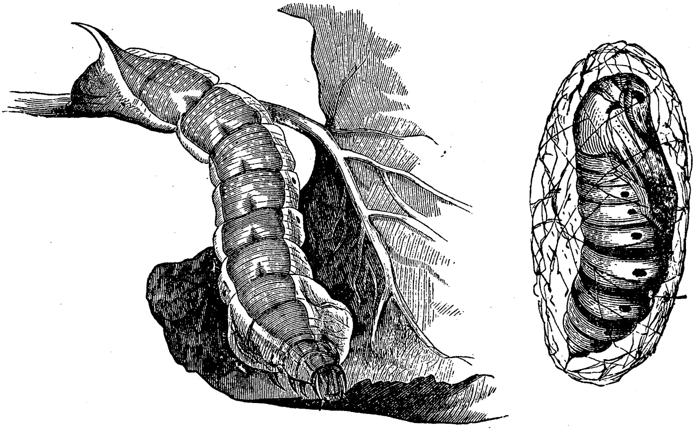
Fig. 127.



Vine Dresser Moth.

ought to have been about thirty millions of bushels, and the corn crop about one hundred and thirty-eight million bushels. Putting the cash value of wheat at $1.25 and that of corn at 50 cents, the cash value of the corn and wheat destroyed by this insignificant little bug, no bigger than a grain of rice, in one single State and one single year, will therefore, according to the above figures, foot up to the astounding total of OVER SEVENTY-THREE MILLIONS OF DOLLARS!" The cabbage butterfly (*Pieris rapæ*), recently introduced (p. 28) from Europe, is estimated by M. Provancher, to annually destroy two hundred and forty thousand dollars' worth of cabbages around Quebec. The Hessian fly, according to Dr. Fitch, destroyed fifteen million dollars worth of wheat in New York State in one year. The army worm of the North (*Leucania unipuncta*), which was so abundant in 1861 from New England to Kansas, was reported to have done damage that year in Eastern Massachusetts exceeding a half million of dollars. The joint worm alone sometimes cuts off whole fields of grain in Virginia and northward. The Colorado potato beetle is steadily moving eastward, now ravaging the fields in Indiana, and only the forethought and ingenuity in devising means of checking its attacks, resulting from a thorough study of its habits will deliver our wasted fields from its direful assaults.

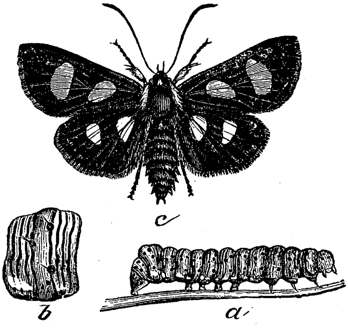
Fig. 128.



Vine Dresser and Pupa.

Indeed the cry of waste, waste, arises all over the land. The money and material that is wasted annually in bad roads, in the loss of fertilizers from wanton waste, the loss from ignorance of geology and mining engineering, the waste involved in the process of extracting ores, the waste from bad cooking, poor housewifery, and above all, the loss of human life from ignorance of scientific laws,* carelessness resulting from ignorance and vice, the offspring of ignorance, — the amount that is thus wasted we venture to assert would, if saved, pay off our national debt in one year, and change our world as it were into a new planet! A century hence when the country is crowded tenfold its present amount, our people will learn the lessons that science and nature teach of economy and thrift.

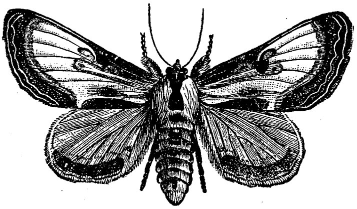
Fig. 129.



Alypia 8-maculata.

These remarks may be thought extravagant, but the thoughtful agriculturist, technical chemist and political economist will agree that they are true. Mr. Riley truthfully states in the introduction to his report that "we have in this country altogether more than our share of these insect depredators, and so truly is this the case, that insects which attract universal attention, and are considered as very serious evils in Europe, would not be deemed worthy of notice in this country. There, if they lose one-fifth of a given crop, the whole community becomes alarmed; but here the cultivator sometimes considers himself fortunate if he secures the half of his crop from insect ravages, and each State loses annually from fifty to sixty million dollars from this cause alone, though but four states have as yet made any attempt to prevent this serious loss." We may reasonably calculate the annual loss in our country alone from noxious animals and the lower plants, such as rust, smut and mildew, as not far from one thousand million of dollars! Of this amount at least one tenth, or one hundred million of dollars annually, could probably be saved by human exertions. Statisticians tell us that within three or four centuries the average of human life has been doubled; the average man lives forty years, where in Spencer's time he lived but twenty. The world since his time has become richer and better in proportion as the race has grown thrifty and economical in human life. So what science and knowledge has done for human life and happiness, science will do for agriculture and the arts. However chimerical our

Fig. 130.



Eudryas grata.

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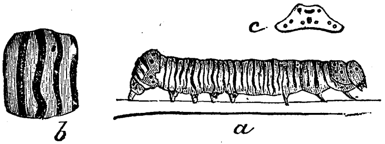
*" In Great Britain alone more than one hundred thousand people perish annually, and at least five times as many sicken grievously, out of pure ignorance of the laws of health, which are never imparted to them at school." — *Dr. Playfair's Address at the British Social Science Congress.*

figures may appear, they at least tend to show that our material wealth and prosperity depend most intimately on the favor shown to science and the encouragement given to original research, however abstruse, by men of scientific tastes.

To save a portion of this annual loss of food stuffs and fruits should be the first object of farmers and gardeners. They eke out a bare livelihood on the present amount raised. Could they save what is wasted by insects they would grow rich; and we therefore advocate legislation for this purpose. Why should we not frame a law providing that farmers should coöperate in taking preventative measures against injurious insects, such as early or late planting of cereals, to avert the attacks of the wheat midge and Hessian fly; the burning of stubble in the autumn and spring to destroy the joint worm; the combined use of proper remedies against the canker worm, and other noxious caterpillars and cut worms? A few of the more enlightened and industrious sort are forehanded and diligent in restraining these pests. A law carried out by a proper State Entomological constabulary, if we may so designate it, would compel idle and shiftless neighbors to clear their farms and gardens. We doubt not that if each State would appoint a State Entomologist with several assistants, who should watch the fields and report neglect in killing injurious insects to the town authorities, by whom delinquents should be fined, many times the cost of maintaining such a bureau would be saved to the State. Indeed, why should we not have an Insect law, as well as Fish and Game laws?

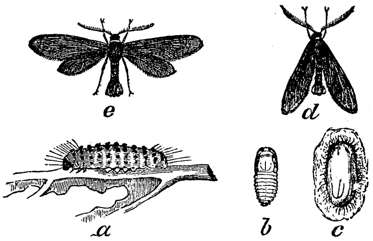
Fig. 131.



Larva of *Eudryas unio*.

Among some of the injurious insects reported on by Mr. Riley is a new pest to the cucumber in the West, the Pickle worm (*Phacellura nitidalis* Cramer, Fig. 126). This is a caterpillar which bores into the cucumbers when large enough to pickle, and it is occasionally found in pickles. Three or four worms occur sometimes in a pickle, and a single one will cause the cucumber to rot. He also gives us excellent drawings of the Vine dresser (*Chœrocampa pampinatrix* Smith and Abbott, Fig. 127 larva and pupa; Fig. 128 adult;), a single caterpillar of which will sometimes "strip a small vine of its leaves in a few nights," and sometimes nips off bunches of half-grown grapes.

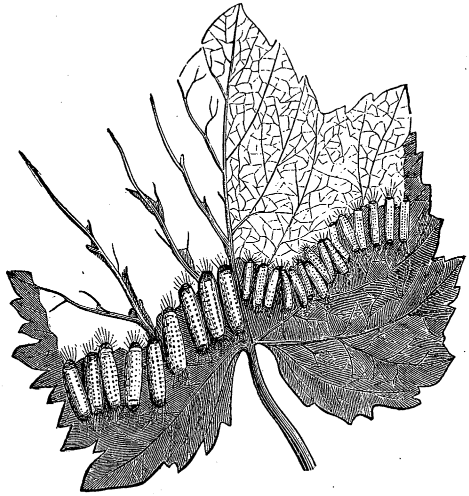
Fig. 132.



Acoloïthus Americana.

Another caterpillar, which sometimes is so abundant as to nearly defoliate the grape vine is the *Alypia* 8-*maculata* Fabr. (Fig. 129; *a*, larva; *b*, side view of a segment). This must not be confounded with the bluish larva of *Eudryas grata* Fabr. (Fig. 130) which differs from the Alypia caterpillar in being bluish, and in wanting the white patches on the sides of the body, and the more prominent hump on the end of the body. Another species, *E. unio* Huebner (Fig. 131 larva, *b*, side view of a segment; *c*, top view of the hump), also feeds on the grape, eating the terminal buds. It is also bluish, and wants the orange bands on the side of the body, as Mr. Riley informs us in a letter. Another moth of the same family is the American procris (*Acoloithus Americana* Clem., Fig. 132 *a*, larva; *b*, pupa; *c*, cocoon); a little dark blue moth, with a deep orange color, whose black and yellow larva is gregarious (Fig. 133) living in companies of a dozen or more and eating the softer parts of the leaves. It is quite common in the Western and Southern States.

Fig. 133.



Larva of *Acoloithus*.

There are over a hundred cuts in this pamphlet, and the mere dissemination of these illustrations will do much towards creating a taste for entomology in the young. The author sometimes admits inelegancies of expression, which mar an otherwise clear and readable style. He complains justly in his preface that the State press has used too poor ink and paper. We trust that the next report will be improved in this respect, as the excellent cuts need good, hard paper.

American Crabs.[*] — In this admirable paper, describing many of our North American Soldier, or Fiddler, Crabs, and their allied forms, Mr. Smith begins a series of beautifully illustrated articles "chiefly made up of notes and descriptions resulting from the study of the higher American Crustacea in the Museum of Yale College, and the collection of the Peabody Academy of Science." The descriptions seem to be carefully and conscientiously prepared. The specimen of *Gelasimus palustris*, with the large fingers (chelipeds) nearly equal in size, and mentioned as a remarkable anomaly in vol. iii, p. 557, of the Naturalist, is now referred by the author to a new species, *Gelasimus pugnax*.

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[*] Notes on American Crustacea, No. 1. Ocypodoidea, with four lithograph plates. By Sidney I. Smith (from the Transactions of the Conn. Academy, vol. ii). 8vo, pp. 63. 1870.